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TRANSLATIONS ON EASTERN EUROPE

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CONTENTS PAGE

MEDA 43 HA HYBRID ANALOG COMPUTER DESCRIBED

East Berlin MESSEN STEUERN REGELN in German Vol 21 No 7, Jul 78 pp 391-395

[Article by K. Kabes, engineer, ZPA Research Institute, Cakovice, Prague]

[Text] The hybrid analog computer MEDA 43 HA has been developed as a desk-top computer. It comprises the computer module units, the combined operating and control unit PSO, the central power supply Z 43, and two interchangeable programming panels (Table 1). The computer module units which are standard equipment for the computer MEDA 43 HA are listed in Table 2.

Figure 1: Affixing the Interchangeable Programming Panel

The combined operating and control unit PSO is fastened below the computer module units. It contains the coefficient panel PPS 12 S and the operating panel OPA of the MEDA 42 TA computer.

The MEDA 43 HA computer is designed for affixing an interchangeable analog programming panel. The programming equipment is produced under a licensing contract with the Institute for Air and Cryogenic Engineering in Dresden. The equipment must be fastened to the computer. It covers the jacks of the module units as well as those of the fixed connection panel of the PSO unit (Figure 1). The jacks of the programming panel are labeled identically with those of the computer units. The interchangeable analog and logical programming panels are used during the programming process. They are designed so that no external connections between them are necessary.

Table 1: Most Important Characteristics of the MEDA 43 HA Computer

- Two interchangeable programming panels
- Built-in computer impedances
- Analog nonlinearities with their own operational amplifiers
- Broader applicability through perfected analog, hybrid, and logical equipment
- Fully electronic control of integrators, memories, and switches
- Built-in parallel logic
- Quartz-controlled timer for synchronized clock pulses
- User-compatible control system with a programmable six-phase control unit
- A simple addressing system, combined with overamplification display
- Possibility of operating two to six computers in parallel, in a selected hierarchy

The most important technical data of the MEDA 43 HA are shown in Table 3. The computer capacity of the system can be expanded by connecting up to six computers in parallel. For the user, it is important that the MEDA 43 HA computer can be connected to all types of the analog computer family MEDA-T. Furthermore, it is possible to couple the MEDA 43 HA computer with a suitable digital computer, by means of a coupling unit (SPOZA 2 etc.).

1. Analog Computer Elements

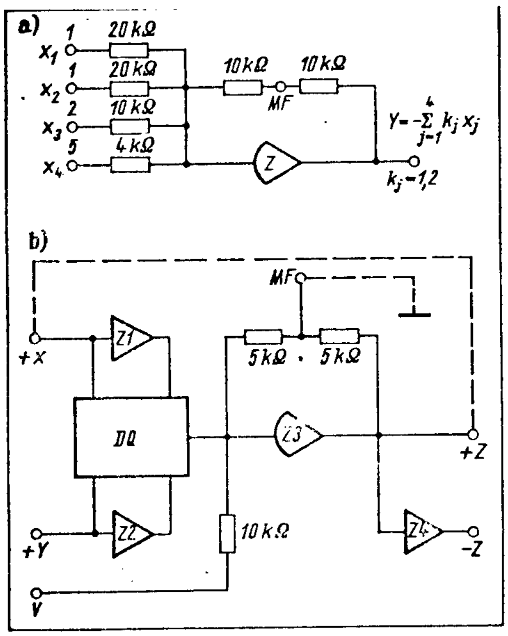
All analog computer elements of the computer are designed for a reference voltage of $\pm$ 10 V. The operational amplifiers are the most important component of the analog computer elements. Altogether 51 operational amplifiers are built into the computer. They include broad-band, drift-compensated, fully transistorized amplifiers of the type D/ZZN 5. Amplifiers of type WSH 112 are produced in hybrid technology. For the user, it is important that most of the programmable analog computer elements are equipped with their own, permanently wired operational amplifiers. This significantly simplifies the wiring of problems on the programming panel. Among the analog computer elements of this computer belong the adders, the diode multipliers/dividers, fixed function generators, typical nonlinearities, and coefficient potentiometers.

Table 2: Computer Module Units of the MEDA 43 HA Computer

Type of Computer Module Unit	Number of Standard Variants	Technical Description
TZP-10	5	Two complete adders
TZP-11	6	Two broad-band operational amplifiers for implementing the logically controlled integrators, and two passive adding circuits
TVZ-10	2	Two logically controlled analog memories
TDQ-10	2	Complete diode multiplier/divider
TZK-10	2	Two combined electronic comparators and logically controlled switches
TFM-11	1	Diode function generators for approximating the functions sin X, cos X, and 1/X
FTM-12	1	Diode function generators for approximating the functions X^3 and log X
TDN-10	1	Typical diode nonlinearities for modeling the ideal diode and the absolute value sum

Each adder has four inputs with transmission coefficients 1, 1, 2, and 5, and a null point input NBS (Figure 2a). The transmission accuracy of all the inputs is better than 0.2 per cent. The center tap of the feedback resistor is grounded. This makes it possible to convert the adder into an open amplifier. The adders are built into the TZP-10 computer module unit in pairs. Passive, three-input adding circuits with weighting coefficients 0.1, 1, 1 serve to expand the adding inputs. These circuits are available in the computer module units TZP-11.

Figure 2: Signal Flow Chart for the Linear Analog Computer Elements



a) Adder (MF--center tap of the feedback resistor)
b) Multiplier/Divider (multiplier output: Y = - (XY + V), divider output: Z = - V/Y for Y > 0, with the wiring of the "dashed" connections); Da--diode squarer

The diode multiplier/divider is temperature-compensated. It is built into the computer module unit TDQ-10, together with all the necessary operational amplifiers. The four-quadrant multiplier can easily be changed over into a two-quadrant divider (Figure 2b). The hybrid operational amplifiers are permanently allocated to the multiplier. The can also be freely used as inverters.

The permanent diode function generators are housed in the computer module units TFM-11 and TFM-12 (Table 2). Each function generator is equipped with its own operational amplifier and is temperature-compensated. It approximates the function with ten to sixteen line segments (Table 4). The typical diode non-lineararities are designed as two models of the ideal diode and one model of the absolute value sum. They are also equipped with their own operational amplifiers, and they are installed in the computer module unit TDN-10.

Linear miniature helical potentiometers ARIPOT 16 are used to set the coefficients, starting values, etc.

2. Hybrid and Logical Computer Elements

The hybrid computer elements are controlled by means of logical signals. They make it possible to convert analog data from the machine variables into digital data and vice versa. Among these important computer elements belong the logically controlled integrators and memories, the comparators, and the switches.

Table 3: Technical Data of the MEDA 43 HA

Reference voltage	± 10 V/0.5 A
Logical level	"0"--0 to 0.4 V "I"--2.4 to 5.25 V
Band width of the computer elements for 3 dB roll-off	100 kHz
Accuracy of linear operations	0.2%
Accuracy of non-linear operations	0.5%
Technical device equipment	Address system, measurement-, display-, and operating-system, capability of connecting up to six computers in parallel, control circuits for the XY recorder BAK 5T, coupling unit SPOZA 2 etc.
Power supply	220 V$^{+10\%}_{-15\%}$, 50 Hz
Power consumption	max. 180 VA
Dimensions	600 mm x 885 mm x 610 mm
Weight	about 120 kg

Table 4: Diode Function Generators of the MEDA 43 HA

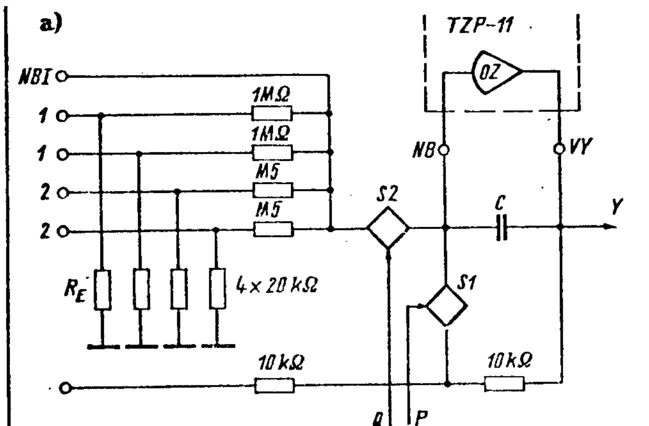
(1) Angenäherte Funktion	(2) Anzahl der Streckenabschnitte	Bereich der Veränderlichen (3) X	Y	Statistische Genauigkeit (4)
$Y = -\sin X$	16	±90°	±1	±0,4 %
$Y = -\cos X$	16	±90°	0 bis −1	±0,4 %
$Y = 1/X$	11	0,1 bis 1 (5)	10 bis1	Für $X < 0{,}3$: $< \pm 1\,\%$ Für $X > 0{,}3$: $\pm 0{,}4\,\%$
$Y = -X^3$	10	0 bis 1	0 bis −1	±0,4 %
$Y = -\log X$	11	1 bis 10	0 bis −1 (1 Dekade)(6)	±0,4 %

1. Approximated function, 2. Number of line segments, 3. Range of variables, 4. Statistical accuracy, 5. To, 6. One decade

The logically controlled integrator has four integration inputs with coefficients 1, 1, 2, 2, the null point input NBI, and the initial value input IC (Figure 3a). By changing the capacity of the integration capacitor, the integration time constant can be selected as 1 s, 100 ms, or 10 ms. For the sections of four integrators, the time constants are selected by means of push buttons or logical signals. With the time constant 1 s, the integration time constant is guaranteed to 0.1 per cent. Logically controlled MOS-FET switches S1 and S2 make it possible to select three operating modes of the integrator (Figure 3b). The integrators can here be centrally controlled, optionally either in groups of two, in sections of four, or altogether. A diode limiter, which can be switched off, limits the output voltage of the integrator. To actualize the integrator, the program wiring must couple all the operational amplifiers of the computer module units TZP-11 with the integrator computing networks that are built into the PSO units.

Figure 3: Logically Controlled Integrator

a)



b)

Schalter (1)		Arbeitsregime des Integrierers (2)
S1	S2	
I	0	ANFANGSWERTE (3)
0	I	INTEGRIEREN (4)
0	I	SPEICHERN (5)
I	I	—
I-Schalter „EIN"; 0-Schalter „AUS" (6)		

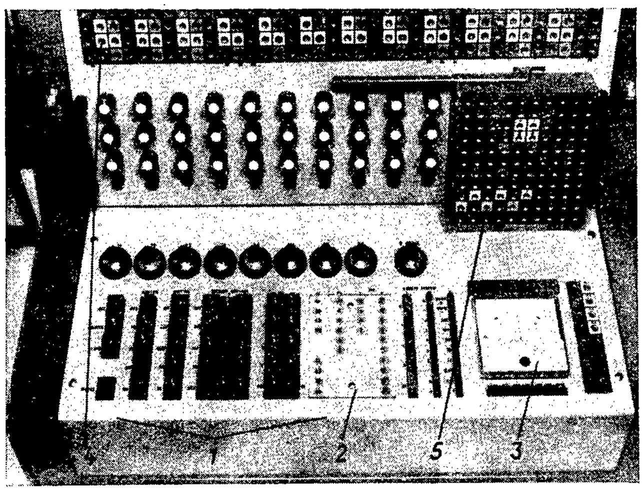
a) Simplified representation, b) Control of the operating mode
Y--Integrator output; R_R--Input resistance; NB, VY--Jacks for connecting the external operational amplifier; Q, P--Logical signals for controlling the switches S1, S2
1. Switch, 2. Working mode of the integrator, 3. Initial values,
4. Integrate, 5. Store, 6. I-switch "on"; 0-switch "off"

A pair of memories is logically controlled and consists of two analog memories of the integrator type. These are housed in the computer module unit TVZ-10. The memories can optionally be used as two direct memories, one direct and one inverse memory, or as an accumulation circuit.

The comparator converts analog signals in binary fashion, by comparing two analog voltages and ascertaining whether their algebraic sum is greater or less than zero. It consists of an operational amplifier with positive feedback, an exciter, two pairs of output switches, and a circuit for displaying the logical output state. In principle, the comparator works as a difference relay. It is here possible to isolate the output switches from the comparator and to use them individually as logically controlled switches. One logically controlled switch and the comparator always form a combined hybrid computer element. Such elements are built pairwise into the computer module unit TZK-10.

The simple asynchronous parallel logic represents an important supplement to the hybrid computer elements. It works with the voltages 0 and 5 V. The logical programming panel (Figure 4) is interchangeable. The following logical computer elements can be freely used, and are brought out to jacks of the programming panel: three AND elements, each with two inputs, one OR-element with three inputs, four universal flip-flops, each with two independent inputs and two push button inputs, and four logically controlled filament lamp indicators for displaying the logical status of selected computer elements. The AND- and OR-elements are provided with a direct as well as an inverse output.

Figure 4: Operating Panel of the MEDA 43 HA Computer



1--Pushbuttons for manual control; 2--Filament lamp display; 3--Measurement device; 4--Permanent connection panel; 5--Interchangeable logical program panel

3. Control System and Control of the Computer Run

The control system of the MEDA 43 HA computer consists of a timer and a programmable control unit for analog calculations. The quartz-controlled timer works with a basic frequency of 1 MHz. By means of a multi-stage decade counter, it is possible to obtain the following clock pulses directly:

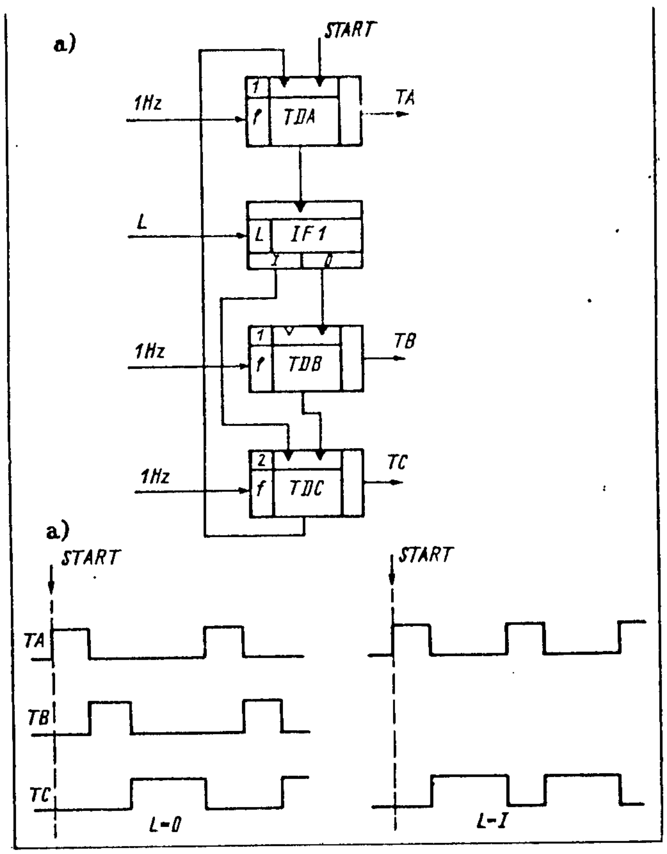
a) 100 kHz clock pulses with the mark-to-space ratio 1 : 1, which are synchronized with the operating modes of the computer,

b) clock pulses with frequencies 10 Hz, 1 Hz, and 0.1 Hz, with the mark-to-space ratio 4 : 1 for controlling the control unit,

c) clock pulses with frequencies 15 Hz, 5 Hz, and 0.5 Hz, with the mark-to-space ratio 1 : 1, for controlling repetitive computations.

By means of the programmable control unit, it is possible to form the required sequence of logical signals and time intervals for automatically controlling the computer elements. It is also possible to implement conditional and unconditional program branches. The control unit consists of six basic and two decision blocks. Each basic block is synchronized by clock pulses and generates time intervals whose length is proportional to the period of the clock pulses. The basic blocks are started by the starting pulses or by the output pulses of another basic block. The decision block serves to process the program.

Figure 5: Typical Wiring of the Control Unit



a) Signal flow plan; c) Time response of the control unit outputs, TDA, TDB, TDC--Basic blocks of the control unit; IF 1--Decision block of the control unit; L--Logical condition

The clock pulses of the timer as well as the inputs and outputs of the basic and decision blocks of the control unit are brought out at the jacks of the interchangeable logical programming panel (Figure 4). A simple example of control unit wiring for controlling an iterative computer run is shown in Figure 5. With the logical condition L = 0, the circuit generates a sequence of time intervals TA, TB, TC; on the other hand, with L = 1, only the time intervals TA and TC are alternately generated.

When the computer is continuously operated, all integrators are centrally controlled by means of push buttons or logical signals, to select the operating modes PREPARATION (IC), COMPUTING (OP), and STOP (HD). With the IC operating mode, the initial values are entered into all the integrators; the integration is performed in the OP operating mode, and it is stored during HD. The integrators work with the basic time constant $\tau = 1$ s. By means of push buttons or signals, the time constants of the integrators can be set at 10 ms or 100 ms. Special push buttons make it possible to withdraw selected integrator sections from central operating mode control.

With repeated computations, the integrators alternate between the operating modes "INITIAL VALUES" (IC) and "INTEGRATORS" (OP). The integrators in the computer are here controlled synchronously or asynchronously by the clock pulses from the timer. In the case of asynchronous control, the integrators in the selected section are always activated inversely. The repeated calculations can be selected by means of the push buttons REP, MED, and FAST on the operating panel (Table 5).

Table 5: Repetition Mode

Push Button	Repetition Rate	Repetition Control	Duration of Computing Phases IC and OP	Repetition Frequency (Hz)
REP	slow	central	1 s	0.5
FAST	fast	central	10 ms	50
MED	medium	sectional	100 ms	5

Iterative and combined calculations are based on the possibility of individually controlling single integrators and analog memories from the programmable control unit. Its outputs are connected to the inputs for single or sectional control of the integrators. They control the computer run according to the specified algorithm.

4. Addressing an Operating System

An advantage of the MEDA 43 HA computer, as compared to the previous MEDA-T computer, is the simple addressing system. The outputs of the most important analog computer elements are connected to the addressing system (capacity 40 decade positions). The addresses are selected in decade fashion, through push buttons on the operating panel (Figure 4). After the address has been selected, the output of the selected computer element is connected either to the built-in measuring device or to an external digital voltmeter.

In order to facilitate operation, the computer is provided with a display and measurement system. The display system consists of a filament lamp display (Figure 4). The statuses of individual logical elements are indicated on the display. Furthermore, the display is used for clearly indicating overamplification of individual drift-compensated operational amplifiers. By means of a special key, an overamplification memory is switched in (automatic start of the computer run). The built-in measurement device can be used as a null indicator of the compensation measurement system, or can be used as a directly indicating voltmeter. The measurement ranges of the voltmeter are selected at the operating panel.

The MEDA 43 HA computer is primarily designed for simulating dynamical systems, which are described by linear and nonlinear differential equations. It calculates the problems in real time or with a selectable repetition frequency. The programmable control unit expands the application of the MEDA 43 HA computer for iterative and combined calculations. In these cases, the following component operations are primarily required:

generating analytical functions by using the subprogram technique,

modeling boundary value problems,

solving optimization and identification problems,

analyzing transmission functions,

solving algebraic and transcendental equations,

solving partial differential equations,

simulating continuous and discrete process and systems, etc.

The MEDA 43 HA computer provides favorable preconditions for wide application, namely: easy operation by the user, simple and clear programming with interchangeable programming panels, and high operating reliability.

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RARE METALS RECOVERY DURING RAW MATERIALS PROCESSING FORESEEN

Budapest KOHASZAT in Hungarian No 6, Jun 78 pp 279-284

[Lecture by Dr Laszlo Kapolyi, deputy minister of heavy industry, presented at the Sixth International Rare Metals Conference held in Pecs, 5-7 Oct 1977: The author presents an extensive survey of domestic rare metal reserves, planned and possible development goals relative to their utilization and research tasks with economic demands taken into consideration]

[Text] 1. Survey of the Domestic Situation

It is well known that the processing character of the Hungarian national economy provides our country with the ability to participate in the international division of labor as one of the developed countries. As a result, one of the fundamental goals of our economic growth is the acquisition of various comparative advantages, among which one must mention the advantages accured from the production structure, the natural conditions of production, our selective dynamic industrial development and the industriousness and know-how of our workforce.

Another essential precondition of our fruitful participation in the international division of labor is fulfilled by the selective export orientation of Hungarian foreign trade.

A particular consequence of selective industrial development is the increasing importance of the quality of nature and, in this connection, the more advanced structural materials, the intensification of various technological processes and the appearance of new technological processes and new products as a result of the dynamic development of the technological base. These combine to form the innovative centers or the systems of innovative centers of the Hungarian economy.

The rare metal conferences have considered this problem on several occasions, as mentioned in the introductory lecture of the comrade state secretary. They have unequivocally stated that the utilization of rare metals is impossible in themselves but can only be utilized within complex production systems.

Why is it necessary to again briefly review the situation of rare metals in the Hungarian raw materials economy at this conference? The answer is that it is impossible to evaluate complex production systems and, in particular, partial systems of rare metal extraction and utilization divorced from the economic environment. The fundamental change in the economic environment is primarily due to the historic shift in the world economy which in the area of raw material economy may be characterized in terms of a transition from a focus on quality to the principle of economics. The explosion of raw material prices and especially energy prices is at the center of this change. It resulted in a fundamental change with regard to foreign purchase opportunities for raw materials and, in particular, raw metals; in addition, the conditions of domestic production and marketing have also changed.

Under changed world economic conditions, a fundamental problem is posed with regard to the restoration or preservation of our foreign trade balance by the shift in the terms of trade and in this connection by the fact that our national economy is at present forced to import nearly 60 percent of its raw material requirements. In order for us to be able to at least preserve this percentage it is necessary to double our production of solid mineral raw materials by the turn of the century, and even this would leave the problem of paying for our imports unsolved.

Before sketching the domestic situation relative to an accounting of rare material reserves and the extraction of rare materials we must agree on a point of view, namely, that geological research, extraction and products must be considered as a single system and the extraction potential of rare metals must be studied as a subsystem within this framework. This study must take into account important processes still under development, e.g., instrumental material investigations coming into general use, process control, and in general, the computerized collection and organization of data regarding the technical and economical parameters of this unified system.

On the basis of the results of research carried out thus far, the situation is to some extent known in broad outlines. No surprising results can be expected from geological investigations near the earth's surface; instead, existing knowledge may be reevaluated in the new economic environment in the light of the technological progress since then. In the area of geological knowledge relative to rare metals, new results can only be expected from investigations carried out at greater depths. In the interests of the evaluation and utilization of existing or expected results vertical integration and a corresponding formulation of a unified industrial policy must be strengthened within industrial production processes. The Ministry of Heavy Industry has received a great deal of help in this area from the Ministry of Metallurgy and Machine Industry, the Ministry of Construction and Urban Development and the Central Geological Office. Successful cooperation exists between several big industrial enterprises, as reflected by the lectures at this conference, e.g., between the Hungarian Aluminum Industry Trust, the Hungarian Iron and Steel Industry Association, the Hungarian Coal Mining Trust, the National Ore and Mineral Mining Enterprise and the enterprise playing a major role at this conference, the Mecsek Ore Mining Enterprise.

2. Survey of important domestic developments related to the utilization of rare metals

As the priorities of economic policy are changing, the development of the domestic raw material economy is changing accordingly. Recsk and the entire Darno line are due for a reevaluation and the possibility of evaluating the heavy nonferrous metal concentrations created as a result of metasomatic processes characterizing the Rudabanya iron ore deposits is of central importance. Thus, we are following the rare metal aspects of the nonferrous metal indications at Rudabanya with great attention. This is to some extent complemented by a reevaluation of the Velence Mountains.

Concentrated special programs have been created aimed at doubling the output of solid mineral mining by the turn of the century, and the production and development of nonferrous metals must be considered within this framework. One of the well-known special programs is the deep mining project at Recsk, the eocene program in the Dunantul which is aimed at the development of coal and bauxite mining, and from the standpoint of our subject it is extremely important to investigate those subprocesses related to the development of bauxite mining and the modernization of aluminous earth manufacturing which involve the utilization of industrial wastes as a secondary raw material source or are directed at the manufacturing of rare metals.

Investigation of Possibilities for Rare Metal Production Connected to the Recsk Development Project

In the area of ore and mineral mining the products which may be mentioned in relation to rare metals are at present the pure nonferrous metal dusts.

In the pure lead dust, from the Gyongyosoroszi, gold reaches 9 g/tons and silver 550 g/tons in the course of flotation dressing of ore. After losses and deductions following contract smelting, this results in the return of about 18 kg of gold and 1.2 tons of silver to the country at the present production.

In the pure zinc dust, from the Gyongyosorosz, the 150-200 g/ton cadmium content of the ore reaches 3,000 g/ton, and of the approximately 16 tons transported out of the country we get back about 6-7 tons of cadmium following contract smelting.

In the Recsk pure energite copper dust, the gold and silver content of the ore is increased to approximately 10 g/ton of Au and 140-150 g/ton of Ag.

After contract smelting, the national economy receives about 50 kg of gold and 600 kg of silver per year. The 150 g/ton selenium content of the ore is increased approximately fivefold and reaches 700-850 g/ton, but this is utilized by the GDR as compensation for the favorable terms of the contract smelting.

The silver content of the pure copper dust from Rudabanya makes up approximately 75 g/ton, of which about 50 kg of silver comes back into the country after contract smelting in Bulgaria.

During the extensive study of the utilization of the Recsk deep ores we performed very detailed and systematic tests involving 56 components with the aim of discovering any potential utilization of rare metals. It was already clear on the basis of preparatory work that the average 60-80 g/ton molybdenum content of the crude ore and the related renium content may be utilized together with the silver found in the anode dross during smelting. The expected quantity of molybdenum metal is 110-120 tons per year in the pure dust. The foreign (Soviet, British and Japanese) experts agree that the recovery of other rare metals (indium, cadmium, cerium, lanthan, etc.) can only be considered after recovery of the basic metals (copper, pyrite, molybdenum) on the basis of production information depending on their concentration levels in various products, byproducts and waste materials.

Investigation of the rare metal content of fuel coals and their utilization

Coal accounts for approximately 40 percent of mineral reserves available in our country, so we will start by investigating the possibilities related to coal utilization with regard to the current eocene program.

In the eocene coal reserves of Central Dunantul the Nagyegyhaza-Many-Csordakut area is of great importance. The coal reserves of this area amount to approximately 275 million tons with an average caloric content of 4,360 kcal/kg. During the surveying of the coal reserves we carried out geochemical investigations (Table 1) in addition to mining and fuel technology studies. Based on the results the elements found in the coal ashes may be divided into 3 groups:

1. Compared to world averages the concentration of V, Cr, Ni, La are significant (concentration coefficient exceeding 2);

2. The concentrations of Ga, Mo, Zn, Zr are approximately equal to world averages;

3. The concentration of B, Be, Ge is below the world average (concentration coefficient under 0.9).

Among the elements listed V and La deserve special attention. The average concentraton of V is 1,500-1,800 g/ton (the maximum reaches 6,600 g/ton!) representing a potential economic value. We know comparatively little about the occurrence of La in Hungary, and this is why it is especially interesting to note its high concentration in Many brown coal compared to the average level in the earth's crust (13 g/ton, Vinogradov) with investigations carried out thus far showing average levels of 220 g/ton (max. 630 g/ton).

The chief consumer of the production system to be based on the eocene coal reserves will be the electric power industry which will use the coal directly in traditional coal-fired power plants or indirectly in the form of gasified coal.

It is appropriate to begin investigations related to the utilization of the rare metal contents of coal used in traditional coal-fired power plants with a study of ashes and smoke gases depending on the behavior of various elements.

Processing of power plant ashes

Hungarian specialists worked out a method for the processing of power plant ashes which is capable of producing cement and aluminous earth from ashes and other nonbasic aluminum silicates. The process is now at a stage when a domestic reference plant with a yearly capacity of 40,000 tons of aluminous earth and 50,000 tons of cement is due for construction. It would be appropriate to investigate the flow of various materials through the reference plant and to work out the technology of rare metal recovery primarily with regard to the expected concentrations of rare metals in the heavy alkali of the aluminous earth hydrate plant.

The recovery of the V and Ni content of power plant ashes may also be accomplished by using a special branch of hydrometallurgy based on bacterial leaching.

The quantity of bacterially oxidized metal that can be recovered using alkali solutions containing ferrous ions depends on the mineral composition of the ash. Since, as a result of domestic ash recovery investigations we are obtaining more and more relevant data and the industrial and investment requirements of bacterial leaching are apparently quite simple, this process seems feasible in the near future.

Rare metal recovery possibilities in the course of coal gasification

In the course of the various coal gasification processes, there is first of all a need for investigating the recovery of those rare metals which are bonded to organic components of coal in the form of celates and other complex chemicals. The feasibility and potential of rare metal recovery may be determined by analyzing rare metal concentrations in gaseous products of coal gasification and tars. However, before carrying out the investigations mentioned there is a need to find out the distribution of rare metals among the organic and inorganic components of the coals to be gasified.

The production of multicomponent alloys containing rare metals

Table 1

Trace element content of brown coal and bauxite of the Nagyegyhaza basin (ppm)

Elem (1)	Kőszén átlag (2)	Kőszén max. (3)	Hamu átlag (4)	Hamu max. (5)	Fő bauxit telep (6)	Fő bauxit telep max (7)
B	60	333	400	1000		
Be	10	30	20	100	8	25
Cr	45	210	200	1000	381	1000
Cu	24	143	60 – 70	400	148	600
Ga	6	30	20	50	54	100
Ge	2,5	7,8	15	60		
La		10		400		
Mo	6	40	30	150	16	25
Nb	néha van (8)	25		50		
Ni	35	200	130	600	248	1600
Pb	10	30	30	150	104	250
Sc		10		40		
V	100	400	350	1000	1230	2500
Zn	100	650	500	5520	268	1000
Zr				1000	540	
Y		10		160		

Key: (1) element
(2) pit coal average
(3) pit coal maximum
(4) ashes, average
(5) ashes, maximum
(6) main bauxite site
(7) main bauxite site, max.
(8) occasionally exists

In the "not for works" category of the coal reserves of the Central Dunantul basin low calorie coals with high ash content represent the greatest percentage. The inclusion and utilization of this coal will improve the economic efficiency of existing production systems. The ash of coals with a high ash content is characterized by aluminum silicates with Al_2O_3 content approximately equal to 25 percent. Since the quantity of material required for reduction of metal oxides found in the ash is available in the form of fixed C content, this category of coal reserves may be regarded as a special raw material base for the manufacturing of a multicomponent FeSiAl type complex alloy. The complex alloy in question contains, in addition to its major components, small quantities of rare metals (V, B, Zr, Ni, etc.), and therefore it can be used successfully in iron metallurgy for purposes of de-oxidation and production of microalloys.

The de-oxidation, desulphuring and microalloying effect of the complex alloy may be greatly increased by raising its rare metal content, especially rare earth elements, because the latter have exceptionally great affinity toward oxygen and sulphur enabling them to form oxysulphides and sulphides when added to molten steel. The rare earth content left after neutralizing the oxygen and sulphur content of steel will improve its structural fabric.

On the basis of these factors it would be appropriate to connect the processing of low-quality shale with the processing of rare earth concentrations available from cola-phosphates intended for fertilizer manufacturing.

The mixing of these two basic materials in various ratios may provide the ability to prevent the formation of rate earth carbides using a suitable SiO_2 content to obtain the most favorable conditions for reduction.

A mixing ratio which takes into account the metallurgical requirements just mentioned could be used in the manufacturing of a complex alloy containing rate earth elements within the following composition parameters:

Si = 20—35%	Ca = 20—25%
Ca = 3— 6%	La = 5—15%
Al = 8—15%	Pr = 3—10%
Mg = 1— 2%	Nd = 1— 3%

Recovery Potential of Rare Metals During Complex Processing of Bauxite and Red Silt

Due to their significance and quantity, high- and low-quality bauxites play an important role among our domestic mineral raw materials. Our well-known high-quality bauxite reserves will last only 25 to 30 years, so the aluminum industry is already considering the formulation of new complex processes which could make it possible to expand the raw material base of aluminum production within the framework of research and development activity.

The processing of high-quality bauxite is carried out in our country using the Bayer technology and is in essence limited to the production of a single product: aluminous earth. In contrast, the profitability of a vertically integrated system for the processing of low-quality bauxite can only be assured if it is regarded as a potential source of iron and rare metals in addition to aluminum.

The average V_2O_5 content of domestic bauxite is 0.14 percent, of which only 7 percent is extracted using current aluminous earth manufacturing technology. Part of the 40 to 60 ppm gallium contained in bauxite is also extracted in the course of aluminous earth manufacturing. The demand for gallium has greatly increased worldwide in the recent past. There is a shortage of both raw and highly pure gallium.

Investigations carried out in recent years (FKI [Metal Industry Research Institute], BKI [Mining Research Institute]) disclosed the rare metal content of currently used bauxites concentrating on 8 elements (Sc, Y, La, Ce, Pr, Nd, Sm, Gd). It has been found that in the red silt produced during the course of the technological processes of aluminous earth manufacturing rare earth metals are present practically in concentrated form with a percentage of 0.1 to 0.18 percent in dry red silt. This means that with every ton of red silt about 1-1.8 kg of rare earth ends up in the slag heap.

It is known from data available in the literature that one of the fundamental conditions necessary for economic processing of red silt is a minimum Fe_2O_2 content of 40 to 45 percent. Domestic red silt in general has a Fe_2O_3 content of 40 percent, thus economic processing is feasible in this case. Complex processing of red silt can be accomplished in a single step using direct selective reduction or, alternatively, in two steps where reduction is preceded by hydrometallurgical dressing. There is substantial research activity going on with respect to both of these methods at several domestic enterprises and research institutes (BKI, Aluterv-FKI [Metal Industry Research Institute], the Tatabanya Coal Mines, NME [abbreviation not known]).

Experiments are being carried out in our country (FKI) to recover valuable components of the red silt (Na_2O, Al_2O_3, V_2O_5 and rare metals) using bacterial leaching.

In addition to the extraction of rare metals from red silt there is an important role played by the direct extraction of rare metals from bauxite, because there is a substantial quantity of low-quality bauxite (containing siderite) which is not suitable for processing in the Bayer system but is being mined in the twin product mines established within the framework of the eocene program.

Relative to the low-quality bauxites containing siderite, in recent years there have been significant results obtained in the Soviet Union in a manner which leads to the recovery of rare metals, primarily vanadium and gallium, and rare earth elements.

One of the tasks for the coming period is to solve the problem of the complex processing of the impure bauxites containing large quantities of rare metals domestically, primarily by using the potential offered by hydrometallurgical processes.

3. Possibilities of Rare Metal Recovery During Complex Processing of Manganese Ore Containing Carbonates

It is well known that our country possesses substantial manganese ore resources containing carbonate. Among the geological resources we know of 70 million tons of manganese ore containing carbonate with 17.52 percent average Mn content in Urkut. These reserves include both the carbonate main site and the upper site. In practical terms, the main site represents the entire amount suitable for processing, which represents 47.7 million tons with an average Mn content of 18.78 percent according to calculations in 1972. This carbonated manganese ore deposit suitable for processing forms a contiguous mass.

The difficulties connected with the processing of the manganese ore in question arise from the conditions of its geological formation.

A mineralogical and structural investigation of the ore has found that the main ore is essentially rodocrosite and manganocalcite. In addition there are smaller quantities of calcite, montmorillonite, some illite, glauconite and quartz.

In addition to the main components, the carbonated manganese ore contains substantial quantities of rare metal elements. (Table 2). Thus, complex processing of the ore is indispensable and in the course of that the extraction of manganese and rare earth metals may be successfully connected. The main Department of Technical Development of the Ministry of Heavy Industry has assigned this problem to the Mining Research Institute.

During pilot plant experiments concerning the hydrometallurgical process designed for the extraction of the ore, series of samples were collected from raw materials and various intermediate products.

From the results of analysis it may be stated that approximately 30 percent of the total quantity of Co and rare earth elements may be transferred into the solution. Within this, the proportion of rare earth metals in the solution was 50 percent. Due to the relatively low concentrations, it is not possible to obtain rare earth concentrates from the solution by using precipitation or extraction. One of the ion exchange methods seems suitable for this purpose.

Extraction of Ores Containing Rare Metals Using Chlorination Heat Treatment

One of the advantageous methods for extracting metals from ores which is becoming more widely used in recent years is halogenide metallurgy which is based on converting metal compounds into chlorides that may be evaporated.

The great activity of elemental chlorine and the relatively easy sublimation of metal chlorides makes it possible to extract highly concentrated valuable metals in a single step and thus the process in question may be successfully employed for economic processing of low-quality ores which are difficult to extract.

Table 2

Analysis of Manganese Ores Used in the Experiment

Vizsgált alkotók (1)		Karbonátos mangánérc (2)
Fő alkotók (%) (3)	Mn	18,1
	Fe	9,8
	Al	2,9
	Mg	2,9
	Ca	2,4
	SiC	20,4
	P	0,25
	SO_3	1,7
Ritka földfém koncentráció (ppm) (4)	Sc	10
	Y	150
	La	52
	Ce	140
	Sm	20
	Gd	60
	Pr	26
	Nd	28
Egyéb nyomelem koncentráció (ppm) (5)	Sn	5,5
	V	42
	Cr	18
	Co	170
	Ni	180
	Sr	420
	Ba	1700

Key: (1) components investigated
(2) Manganese ore containing carbonate
(3) Main components (%)
(4) Concentration of rare earth elements (ppm)
(5) Concentration of other trace elements (ppm)

Based on these considerations a wide range of investigations was carried out in recent years in the area of chlorine metallurgy and these investigations extended in part to the extraction of rare metals.

Among these the research carried out at the BKI deserves mention: it explored the variations of rare metal concentrations in various basic materials during chlorine evaporation.

The potential uses of rare metals found in Gyongyosoroszi nonferrous metal deserve investigation in connection with the Recsk development project. The concentration of B, Ga, As, Sr, Ca, Th, W, Gd and Sb shows noticeable variations during chlorine treatment. Among the elements listed Th, W, and Gd are concentrated in the ash, As, Sr, In and Sb leave with the evaporated products and in the case of B, Ga, and Ce some fluctuation is observed.

The few rare metal components found in the Szarvasko wehrlit ore whose concentration was affected by the conditions of the experiment are Ag, B, As, Co, Be, Nd, and In. The extraction of the rare metal content of the copper refinery anode silts was also considered together with chlorination processing of low-quality loamy bauxite and other raw materials containing bauxite.

5. Other Raw Materials

Glass Sand

In order to supply domestic glass manufacturers the OEAB [expansion unknown] is at present expanding its glass-sand pit at Fehervarcgurgo together with its flotation treatment plant. This will increase glass-sand production capacity to 550,000 tons per year.

The slag resulting from glass-sand preparation contains significant quantities of magnetite, illmenite and zirconium which must be removed by flotation as a coloring impurity. At a yearly production of 550,000 tons of glass-sand the flotation foam will total 50,000 tons. The magnetite and illumenite content of the flotated product may be extracted using dual magnetic separation of differing intensities and the remaining nonmagnetic product contains various silicates. Among the latter a major role is played (approximately 30 percent) by zircon which may be extracted using further flotation. The product obtained could be utilized in the fire resistant materials industry and the production of metallurgical alloying materials. These users are at present supplying their requirements in this area from imports.

Utilization of Salty Surface and Ground Waters

Chemical analysis of trace elements in underground fluids and solid materials has been carried out in our country since 1960. About 40 percent of the samples examined consists of ground water. On the basis of this work a complete analysis of the macrocomponents of ground waters is available. In the beginning classical analytic methods were used but later they were gradually replaced by instrumental analysis. About 150 to 200 samples are analyzed every year. These water samples are obtained in general from depths exceeding 500 meters. The elements studied were grouped into three categories: macrocomponents, microcomponents and trace elements.

Among the macrocomponents the Na, K, Fe, Ca, Mg, NH+, Ce, CO2/3, SO2/4, R--COO-, HBO_2 and H_2SiO_3 concentrations are under investigation.

Among the microcomponents they are Br-, J-.

Among the trace elements the Cd, Ba, As, Mn, Pb, Al, Be, Mo, Sn, Si, Cu, Zn, Ti, Ag, Ni, Sr, K and Cr are being investigated.

Among these the B, Br–, J– and Li content seem to be the most easily recoverable as a source of rare metal. It is not possible to determine Rb and Cs levels with the equipment available, and thus we do not know about their occurrence. Based on an evaluation of the investigations carried out thus far we may conclude that the processing of ground waters in question (especially the ones with high salt content) may be considered economically feasible if it is carried out within a complex system, i.e., in addition to rare metals the entire salt content is also extracted.

Potassium Tuffs

Among the rare metal target program goals is the cataloging of the rare alkali content of rocks and the investigation of potential extraction techniques. Thus far investigations centered on potassium tuffs near Szerencs which have a K_2O content varying between 3.0 and 5.0 percent and also have substantial quantities of other alkali metals, thus in the area of the raw materials mentioned the primary emphasis is expected to be on processing within a complex system.

6. The Utilization of Rare Metals

Based on the point of view mentioned in the introduction, after discussing rare metal resources and extraction potential we give a brief survey of the areas of rare metal utilization in Table 3. In doing this we do not aim at completeness; we shall emphasize the functional uses of rare metals, these being the value formation phases which determine the economic advantages accruing from the utilization of rare metals, i.e., the importance of this problem to the national economy. There is a need for a more extensive discussion of agricultural utilization which is a little known but significant area due to its importance.

The trace element content of our soils is on the whole satisfactory relative to B, Mo and Zn in approximately 80 percent of cultivated land. However, from the investigations carried out thus far it is likely that even on soils containing sufficient amounts of trace elements we can expect nutrient deficiencies, mainly deficiencies of Cu and Mo.

We can compensate for the trace elements lacking in agricultural areas by applying fertilizers containing microelements.

In addition to increased harvest this may also improve product quality (for example, Mo fertilization increases the protein content of animal feeds); the resulting improvement in results in this case is due to the added value contributed by rare metals.

Table 3

Utilization of Rare Metals

Area of Utilization	Function	Examples
1. Ferrous metallurgy		
1.1. Steelmaking	de-oxidation sulphur removal microalloys improving wear resistance improving heat resistance improved grindability higher melting point	Ce-mischmetall (quality steels) Niobium Gallium Tellurium Rare earth metals
1.2. Founding	improvement of the structure and properties of alloys improved founding properties improved shaping	rare earth metals (cable wires)
2. Nonferrous metallurgy	improving the technical parameters of copper and copper alloys	brass, tin bronze nickel silver molybdenum alloys
3. Inorganic chemical industry	Catalization of processes in sulphuric acid manufacturing	Application of V_2O_5
	Catalization of processes in nitric acid manufacturing	Application of platinum-rodium alloy
4. Organic chemical industry	Cyclohexan oxidation	CoO, NiO, Cr_2O_3 activated oxides with high specific surface
	Oxidation of metyl alcohol to produce formaldehydes	Application of activated surface oxide mixtures
	Oxidation of olefines	Bi-Mo mixed catalyst
	Cyclohexan conversion	$Pt-Al_2O_3$ halogen
	petroleum processing	Catalysts containing Pt and rare earth metals

Table 3 [continued]

Area of Utilization	Function	Examples
5. Fire resistant material industry	improvement of physical, chemical and thermomechanical properties of furnace construction materials subjected to extreme conditions	Application of ceramic materials containing rare earth metal oxides
	quality corund product manufactured using domestic raw material base	Ceramic material containing rare earth metal oxides
6. Glass industry	Coloring and decoloring of glass	coloring and decoloring effects of rare earth metal oxides
7. Lighting technology	manufacturing of highly efficient fluorescent dust	Application of rare earth metal oxide
	production of long life incandescent filaments	manufacturing of wolfram wire and coil
8. Electronics and instruments	manufacturing of microwave semiconductor devices	growing of single-crystal Si-epitaxial layers
		Possibility of non-Si-based (e.g. GaAs) semiconductor layers
	Possibility of designing instruments using digital technology	Application of semiconductor Ga-diodes
	production of base materials for magnetic bubble memories	rare earth metal granite type single-crystal epitaxial films and rare earth metal/transition metal on amorphous films

Table 3 [continued]

Area of Utilization	Function	Examples
9. Electrical industry	possibility of producing low- and high-voltage contact materials	Utilization in soil mechanics increasing the life expectancy and reliability of switching circuits
	possibility of producing hard magnets from oxide and metallic base materials	rare earth Co-magnets applied in microwave components and DC motors
10. Agriculture	improved soil composition	

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PROGRAM FOR COMPUTERIZED AUTOMATION SYSTEMS EXAMINED

Warsaw ZYCIE WARSZAWY in Polish 7 Sep 78 Supplement pp 1-2

/Article by Tadeusz Podwysocki/

/Text/ Economic problems of the world do not deter the development of the computer industry. Quite to the contrary, automation of production and management processes serves as a means of reducing costs and improving quality, with a simultaneous gradual limiting of the employment level. Engineering cybernetics can be one of the best tools for ensuring economic efficiency in years of hardship. Recently the FINANCIAL TIMES published a market forecast for electronic equipment in the United States, Japan, and Western Europe to the year 1982. According to that analysis, twice as many computeres will be sold by then as in 1976 (on the basis of 1976 prices), i.e., the sales will reach...60 billion dollars!

In Poland, too, the strategy for economic growth is based on a computerization and automation of all important activities in the country. We regard computerization of the national economy as a means of improving productivity as well as product quality, of reducing consumption of both raw and finished materials and energy, of providing more efficient transportation, of reducing the pollution of our environment, and of modernizing educational systems. One essential task of computerization is to impose order on the organization and improvement of methods of economic management, at all levels to be sure.

These aims, important to society and the national economy, are faithfully reflected in the grand research program (nodal problem) "Development of Computer Systems for Automation and Measurements." Activities under this program cover the 1976-85 period. Its implementation during the current five-year plan requires an expenditure of 4.5 billion zlotys. The crux of the matter is that traditional enterprises engaged in modernizing individual segments of a technological process, organizationally or technically, are not producing the expected results. Only by complex automation is it possible to utilize available reserves and to improve both the efficiency and quality of labor. This is so, because in this way all essential elements in a factory, mine, or foundry become automated: the technological process, production planning, production control, deliveries, inventory, and engineering activities (design and construction). Experts in this field maintain that complex automation leaves no area of activity untouched by progress and no area should become a roadblock.

Main Trends

The grand research and development program of computerized automation and measurement systems has evolved from the strategy of our engineering cybernetics industry (consolidated into the MERA Combine) to meet the needs of its major customers. As a result, these customers receive modern and complete equipment enabling them to install "total" computerization in their enterprises. This procedure yields the maximum economic benefit. It is worthwhile to note at this point that in the cost structure of a computerized automation system as much as 60 percent of all expenditures is for materials and equipment, only 10 percent is for installation and startup, but 30 percent is for design and software.

Which main areas will be encompassed by computerization? They include, above all, health care for the population. Computerization is to cover here medical records and data processing in hospitals and health centers, intensive supervision of the seriously ill, and in the 1980s there will be set up an information system monitoring the state of health of the citizenry.

Computerization will also involve science and higher education. Electronic computer technology will be made available to scientific research institutions and universities. After 1980, moreover, computers will be brought to secondary schools and the accessibility of digital computers to individuals become widespread: by remote data transmitters and intelligent terminals, of course.

Complex automation of the manufacturing industry and transportation began with data recording and processing, then with automation of technological processes. It has already encompassed design and other engineering activities, and in the 1980s it should result in an optimal production control.

Commerce and services are also areas which will be computerized at the earliest, because any delay here would be most noticeable. Large warehouses will be computerized first, wholesalers and sales offices next, finally in 1980-85 automation of sales will include small warehouses and even service centers.

Computerization of administration and management started in the Main Bureau of Statistics and in banks, which had been engaged in data acquisition and processing even before 1975. Central management and planning institutions are already computerized at this time, while information systems are being installed at regional levels of planning and management. In the 1980s this process will extend to local units of administration. Such a strategy for computerizing the national economy has been documented by the PZPC Central Committee at its 12th Plenary Congress.

Science and Practice

Current work in research, development, and application of computerized automation systems is focused on starting and operating 27 pilot models. About 80 computerized automation systems are expected to be brought into the national economy by 1980. All these systems will, moreover, contain mostly domestically manufactured equipment: R-32 computers, MERA-400 and MERA-300 minicomputers, intelligent terminals, many meters and probes as well as other components for measuring, counting, and transmitting primary information.

The main thrust of research and development work has been shifted to so-called plant systems, according to the Chief Director of the MERA Combine, Jerzy Huk M.Sc.Engr., basic devices and equipment by their very nature requiring a more diverse and laborious effort, which is now subordinated to the main goal of building systems for entire plants.

Complex automation requires tapping a tremendous research capacity. The object must be identified precisely, in fact, so that the appropriate software can be provided. Most work in this area is of a pioneering nature, with a heavy innovative content. The participation of not only 17 of MEAR's R&D laboratories and support units but also of 6 academic institutions had been enlisted for the grand research program. The latter included even the Neurological Clinic at the Academy of Medicine in Warsaw and the Wrocaw Polytechnic Institute. Work is also being done at the Institute of Nuclear Research and the Institute of Plasma Physics and Laser Microsynthesis.

This concentration of all research and development capacity has already yielded results. Already 26 research projects were completed in 1976 and 52 one year later. This means 78 models available for practical implementation within the last 2 years. At this time there are in operation 10 pilot systems, which include: a control system for processing bituminous coal in the "Jozwin" mine, a system for materials management by construction enterprises in Gdansk, a system for postal accounting in Wrocaw, a banking system for the Bydgoszcz branch of the National Bank, a system for production planning at the "Bierut" sheetmetal rolling mill in Czestochowa, a system for management and engineering at the POLMO SHL in Kielce, and a promising system for agrotechnical optimization at the Main Center of Research on Varieties of Crop Plants in Supa Wielka.

In the privacy of a laboratory are created more systems, among them two experimental modules "Laboratorium" and "Patologia" of a computer subsystem for hospitals. Also built are a design system for railroad design offices, a control system for "Narvik" machine tools, a system for automation of engineering effort, a system for technical preparation of production setups, and a computerized management system "Opoka" for the Katowice foundry. A computerized system for commerce and banking is in the design stage. Pilot systems for production control at PREDOM, POLAR, MERA-PNEFAL, and MERA-ELWRO are also underway. A computerized system for seat reservations for the railroad administrations in CEMA countries as well as a system for railroad traffic control and railroad station supervision are being prepared. Research is expected to solve the problem of computerized large-scale studies pertaining to the state of health of the population.

Information technology is also to serve environmental protection. An "Odra-1305" computer will be engaged for inspecting the quality of water at the Nitrogen Plant in Tarnow and a system for dynamic neutralization of industrial waste is to operate with the aid of a MERA-400 computer. An interesting project is the system for managing the production and scientific research complex of the machine manufacturing industry. This system will use the excellent monolithic R-32 computer built by ELWRO for the EMC system of CEMA member countries.

New Equipment

Implementation of such a grand computerization program on such a high technical level requires new equipment.

The production of many modern devices such as the R-32 computer was set up and started during the last 3 years, the experimental series of the R-32 computer having been built in 1977. The hardware and software configuration of the MERA-100 minicomputer was expanded. An "off-line" version of the MERA-300 system was introduced, with a screen-type MERA monitor of data input. The list of new products developed and manufactured is much longer. All modern components of these computer systems have been built within the scope of the grand automation and measurements development program.

An analysis of our computer equipment for degree of modernization indicates that, for example, the R-32 computer system with a message processor is technically equal to the IBM 370/145 digital computer manufactured in the United States and the MERA-400 minicomputer system (641 words, expanded configuration) is in no way inferior to the American PDP 11/34 or the French "Solar-16" with worldwide reputations. This is the result of an accumulation of engineering and manufacturing experience. In fact, MERA has already produced over 1,500 computers and minicomputers, has automated over 500 powerplants, 80 sugar mills, and 250 vessels.

Other Side of the Coin

We thus have a computerization and automation program for selected branches of the national economy, and new control systems are installed by industry, but all this is only one side of the coin. What can a factory, foundry, or mine do with a most advanced information system for which a lot of money has been spent, if it should fail in service later on and replacement parts are not available?

Service has so far certainly been the weak spot of the Polish computer industry. There is a shortage of maintenance personnel. And yet it is inadmissible that clearing a fault, which can always happen to be necessary, should take weeks. Computerized automation is technically and economically effective only with efficient and expert service available. While developing computer technology, one must simultaneously pay attention to the proper use of expensive equipment.

Quite often spare parts are unavailable. This is, just as service is, an Achilles heel of our information equipment industry. Success of the computerization program will depend on a radical change in this situation.

Computer equipment and automation apparatus require rather highly qualified service. The use of production control systems and electronic devices differs greatly from the use of a plain valve, switch, or conventional meter. Servicing modern equipment requires the proper knowledge. Meanwhile, users of computerized automation equipment have so far not been adequately trained. The training of service personnel for maintenance of information engineering equipment must meet the need for it, lest a lack of qualified and well prepared crews becomes a hindrance.

It appears that in Poland it takes now from 1½ to several years for a computerized automation system to evolve from the initial conception of a ready-for-use product. According to Jerzy Huk, the process includes identification, algorithmization, system design, programming, delivery and installation of equipment, and startup.

One must remember, moreover, that a computerized automation system can cost from 100 to 500 million zlotys and consists of many thousand devices.

It thus makes no sense to manufacture here all the computer components produced in the world. It is far better to concentrate on and specialize in the production and complex automation of selected enterprises. This is, indeed, done. Polish specialities already include automation of plants where sulfuric acid is produced, of sugar mills, of paper mills, of masonite plate assembly lines, and in the future probably also of hospitals, schools, and farms.

It is the opinion of Jerzy Huk that the only solution to the problem will be to rely on enterprises specializing in deliveries from our neighbors, i.e., on a specialization policy within the CEMA framework.

In the field of computer technology it does not seem feasible to develop all items to their proper quality level and then manufacture them. No country in the world can afford that. For this reason, the program of developing the Polish computer industry takes into account the specialization aspect, allowing for division of labor and cooperation on the international level. Accordingly, into the Polish economy will be brought computerized automation systems with components imported from the USSR, the GDR, or Czechoslovakia. Indeed, the word complex also implies joint, efficient, fast, and modern. In our era of progress, after all, the automation equipment industry is in the forefront and a trail blazer for technical advancement.

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POLAND

DOMESTIC RADAR PRODUCTION REVIEWED

Radar Industry Development

Warsaw ZOLNIERZ WOLNOSCI in Polish 11 Sep 78 p 4

[Article by Lt Roman Lercher: "Nysa Was the First..."]

[Text] It is not every day that we encounter such terms as: marine navigation radar, area control radar, approach control station and Doppler radar. Nevertheless we benefit from them, even though we may not be aware of it. For a ship does not exist that would attempt to navigate without a navigation radar in waters congested with ocean liners, especially in bad weather. There is not a single airport that does not use radar to guide aircraft landings. Finally, is there a driver who has not been stopped at least once by a highway patrol car equipped with speed monitoring devices? A common denominator for the above-mentioned equipment is the fact that they are produced by our very own radar industry, which this month will be celebrating its 25th year of existence.

Military Application of Radar Technology

The rapid development of radar during the last war as well as during the postwar years was linked above all to military application of radar technology.

This was instigated by the dynamic increase in aerial assault weapons: jet aircraft and rockets. Today radar is essential equipment for all modern armed forces, especially air defense troops, rocket troops, naval forces and frontier guards.

The development of radar in Poland began in the waning years of the 1940s. In the postwar period work already was being conducted in the area of radio engineering, forming the foundation for the development of radar technology. The most outstanding work was done by Prof Dr Janusz Groszkowski and Prof Dr Stanislaw Ryzek in the field of magnetron microwave oscillators.

The first radar model, called R1, was built in 1948 at Warsaw Polytechnic's Radar Department, directed by Prof Dr Pawel Szulkin, and at the Industrial

Institute of Communications [PIT]. It operated on a frequency of 200 MHz and a 5 microsecond pulse width. Then, after overcoming many difficulties in the laboratory and with material supplies, the prototype of the first Polish "Nysa A" radar station was developed at the TL laboratory during the next 4 years. At the end of 1953 and beginning of 1954 five units of this model were built for experimental use by the armed services.

This station, which was designed to detect aircraft as well as determine their azimuths and ranges, operated at a wavelength of about 50 cm with a 200-kW scanning pulse. The radar was mounted on two ZIS-150 vehicles. One of the vehicles contained the transceiver and display, and the second vehicle contained two power supply units, a generator, a modulator feed as well as a parabolic antenna with a 3-meter diameter radar dish.

This was a great technical accomplishment for those years, and the team that developed Nysa, which included Prof Dr Eng P. Szulkin, Magister Engineers J. Auerbach, T. Gawron, S. Urbanski, J. Hrynkiewicz, J. Szyszkiewicz and Z. Drejak as well as Z. Szczypka and A. Lebodziec, received in 1953 a First Degree State Award.

For Air Traffic Control Needs

The difficult and at the same time successful start was now a thing of the past. Research work in the field of radar increased its tempo, and work was initiated on difficult investigations and design of equipment for air traffic control needs and marine navigation. In 1958, the Avia area control radar was installed at Warsaw's Okecie Airport. This also was a great accomplishment in as much as Warsaw had a modern radar operating in the 23-cm band 2 years earlier than Paris.

Based on system and subassembly development work, the Avia B area control radar, whose construction was modern and whose design was in step with modern radar technology development trends, was developed 10 years later.

For developing Avia as well as Avia B, the group of workers from the PIT and the Lamina Experimental Vacuum Tubes Plants received the Second Degree ZYCIA WARSZAWY award, and the Warsaw chapter of the Association of Polish Electrical Engineers [SEP] received the "Master of Technology--Warsaw 1959 and 1968" award. The fact that this radar has been installed and has been in operation for a long time at several domestic airports, including Cottbus and Neubrandenburg, is proof of its good design.

The most recent version, Avia D, presently is in operation at the Berlin airport where it is used to control and direct air traffic. It ensures continuous observation and enables either visual or instrument-aided aircraft landings. Its two transceiver channels increase its reliability of operation.

At the same time, Avia D serves as a good example of technological collaboration among the socialist countries in as much as its development was based on our own experiences as well as those of the Soviet Union and the GDR (Avia contains a Soviet-manufactured secondary radar). Because of its parameters and many up-to-date designs, including regulation of polarization which ensures the attenuation of detrimental reflections from storm clouds, the station is considered to be among the best of its type in the world, as attested to by the positive opinions of its operators.

Marine Radar Equipment

Along with radar for aircraft, research and development work is being conducted in the field of marine radar equipment with the close collaboration of appropriate development institutions in industry. Initial work in this field began in 1956 at the Warsaw Radio Plants [WZR] under the direction of Magister Eng Janusz Brozyn. Two years later a departmental design office was established which was directed by J. Brozyn up to 1961, and then by Magister Eng Henryk Chyrka from 1961-63, and from 1963 to the present by Andrzej Peczkowski.

The RLM-61, developed in 1958, was the prototype marine navigation radar. Over a period of 7 years, Rawar WZR produced almost 100 units of this radar in its initial and modernized versions. The radar consisted of a display, equipped with a 12-inch diameter cathode ray tube, it had a range of 50 nautical miles, its pulse power was 40 kW, and its power consumption was 1.2 kW.

This is now history. The present age is such that all of the Polish fleet's requirements for this type equipment is satisfied by our own radar industry, and, what is more, a significant number are exported to the CEMA countries. The largest radar in the SRN-600 series is installed, among other places, on the "Rysa 2". The smallest radar, on the other hand, is the SRN-200 series, is being satisfactorily used by fishing cutters and yachts.

Some interesting facts regarding the last mentioned radar are that it uses very little power--about 100 watts, or only as much as a light bulb; it is very light--about 60 kg, and its range is up to 32 nautical miles, which for this requirement and type of equipment is significant. In addition, it is very reliable. Before it leaves the manufacturing plant, it is subject to mechanical and environmental tests--200 hours of "torture" and rapidly changing conditions, for example, temperature changes from 0° to 45°C.

And what does the future hold? The SRN-700 radar series is in the prototype stage. This series employs many up-to-date designs in accordance with modern design requirements.

Among other things, it will operate on a 10-cm wavelength (3-cm radars, despite many advantages, are not very useful in fog or heavy rain; that is why the present goal is to install both 3- and 10-cm radars on board ships), its range of observation will exceed 60 miles, and it will include a special electron tube coil (an electronic rather than the hitherto mechanical feedback system for antenna rotation) which will increase its reliability significantly.

The intensity of work performed by the design office is attested to by the fact that on average a new type radar is designed every year. This also includes auxiliary equipment and assemblies such as, for example, anticollision devices which signal that a ship is on a collision course with another ship (the absence of such a system was the cause of the 1968 [sic] Andrea Doria catastrophy).

Interference reduction devices prevent overlaping of two images which occurs when using radars operating on different wavelengths. But radar switching systems permit joint operation of two different radars, for example, the antenna of the first radar with the transmitter of the second radar and so forth (in case of temporary failure, rework).

Doppler Radars

A lesser known Polish radar which automobile drivers encounter most frequently in Doppler radar.

Hidden behind this strange name are speed measurement devices used by the Citizen's Militia [MO] to detect and punish speeding drivers. Work on this equipment began in 1960, and the type RMP-5a operating model, which fulfills all requirements of the road traffic control service, was designed at Warsaw Polytechnic's Radar Department by Dr Eng Andrzej Lizon's group. In the 1969-73 period over 100 RMP-100 radars were built, of which 40 were sold to Bulgaria.

This equipment has a range of up to 200 meters; it can determine speeds within an accuracy of 2 km/h for speeds up to 160 km/h, and its power consumption is 30 watts. A newer version of the above-described radar is the RMPS-101, which is especially useful for heavy traffic. Its principle of operation depends on directing beams at a certain angle at the vehicle under observation. Beyond this it can be used in conjunction with a photographic recording device developed at the Polish Optical Plants [PZO].

Is there more? Yes. There a number of devices we can list that have been designed and produced by the radar industry. Of course there are many types of radars which our armed forces use. Other radars guard Poland's borders, especially the sea coast.

A number of less complicated devices, which perhaps we can call side production, have also come into being such as, for example, the Kontakt 300 subminiature personal radio-telephone, the microwave oven and the CERBER burglar alarm system. Work is being conducted on microwave applications in other areas--frequently completely different areas--as, for example, commissioning the Antiques Conservation Laboratory [PKZ] to counteract biological destruction. In addition a parametric amplifier has been developed for the Jagiellonian University for astronomy research.

It is not possible, however, to list everything, especially since the output of 25 years of work is impressive with regard to quantity as well as quality. Undoubtedly electronics is one of the most dynamically expanding fields of science and technology. It is being applied with increasing intensity in all areas of the economy, culture and defense, directly or indirectly deciding their modernity, effectiveness and capability for further progress. New discoveries and new developments create new, previously non-existent prospects; they chance proportions and revolutionize old ideas. Man, however, determines all. And when such people exist as those who created the framework for Poland's radar technology as well as those who presently work in this field, one can be certain that even the most difficult and most responsible tasks will be completed.

Air Traffic Control

Warsaw WOJSKOWY PRZEGLAD TECHNICZNY in Polish No 4, Apr 78 pp 36-40

[Article by Col Magister Eng Tadeusz Szafarz: "Air Traffic Control Equipment"]

[Excerpts] The Avia BM radar presently in use in Poland has a detection range of 270 km and a ceiling of 30,000 meters. Its rapidly revolving antenna ensures a rapid rate of gathering information of immediate interest, which is essential when dealing with heavy air traffic. To eliminate interference, the radar includes analog constant echo suppression circuits, a polarizer and a tilted antenna.

Avia C is the most recent Polish radar development for area control. It was designed to significantly reduce ground clutter, meteorological echoes and the like. This will permit automation of detection processes. Much attention was devoted to its operating reliability. It contains a reserve antenna system fitted with bearings, a backup antenna drive system, a modulator using semi-conductors, solid-state receiver circuitry, and digital control systems. The triple frequently allocation system guarantees uninterrupted operation even if one of its channels is impaired.

Table 1

	Type of radar
	Area control radar
Parameters	Avia C, Poland
Detection range (km)	350/450
Detection ceiling (m)	22000/28000
Frequency band (MHz)	1305 - 1390
Pulse energy (MW)	1,5
Pulse width (microseconds)	3
Pulse repetition frequency (pulses/sec)	380
Number of transmitting channels and type of operation	3 Frequency diversity
Active line noise factor (dB)	3,5
Visibility improvement factor (dB)	25
Number of beams	2
Horizontal beamwidth (°)	1
Vertical beamwidth (°)	45
Polarization	Horizontal-circular-vertical

Table 2. Basic parameters of some radio stations used in air traffic control systems

Type of radio station	Parameters				
	Frequency band (MHz)	Transmitter power (W)	Receiver sensitivity (microvolts)	Input voltage	Note
RS-6102	118-138	8	min. 1.5	13.75/27.5	Deck radio station
RS-6103	118-136	1.5	min. 1.5	12	Airport and mobile radio station
RS-6104	118-136	8	min. 1.5	220 AC or 12VDC	Airport radio station, stationary
Jadro-1 (USSR)	2-18	100	3/5	27	Temperature range: -55 to +55° C

In all types of air traffic control systems UHF and HF are the primary means of communications by which aircraft control centers maintain contact with pilots. In Poland such radio stations are produced by Unitra-Unimor. The 800-channel RS-1602 transceiver is designed to be installed on airplane or helicopter decks. The modern system of press-button frequency programming enables rapid selection of a given channel. The radio station can also be used as a deck telephone.

The RS-6103 and RS-6104 radio stations are used to aid airplane and helicopter takeoffs and landings. The RS-6103 is a portable device contained in a leather case. It consists of a receiver-transmitter unit, a battery-operated feeder with charging mechanism, a microphone and an antenna. The RS-6104 radio station is used as a stationary communications center. The equipment is automatically switched to battery in the event of 220-volt line failure. Transmitter and receiver signals can be automatically recorded on a cassette tape recorder.

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ORGANIZATION, OPERATION OF COMPUTER NETWORK DESCRIBED

Paris ZERO UN INFORMATIQUE in French 4 Sep 78 pp 10-11

[Article by Michele Le Gallou: "Information Processing in Romania: A Very Centralized Organization"]

[Text] Romania covers 237,500 square kilometers, has 21 million inhabitants, and is surrounded by Bulgaria, Yugoslavia, Hungary, and Russia. It is a member of the Group of 77 (developing nations) and observer in the group of non-aligned nations. In 1970, Romania signed an agreement with France for the manufacture under license, of CII computers model IRIS 50 (FELIX series). Since that time, a close cooperation has been maintained with France in the field of information science, particularly as a result of delegations of the Agency for Industrial and Economic Technical Cooperation (ACTIM). One such joint meeting was held in Bucharest from 17 to 22 July 1978, on the topic "Information Processing and Financial Systems".

The organization of information processing in Romania is very centralized. The National Committee for Science and Technology (CNST) is responsible for all the development in the country, from basic research to the industrial production of products. CNST covers 12 central institutes and three academies, representing all the major branches of the national economy.

One of the 12 institutes is primarily charged with information processing: the Central Institute for Management and Information Science (ICI), created by the Decision of the Council of Ministers of 1 July 1970. The major goal of this organization is to assure the homogeneous development and the introduction of information science into the national economy under the best possible conditions.

Fully Compatible Systems

ICI is divided into eight sections:

Information science research and development;

Development and introduction of information processing systems for economic management and technical process controls;

Studies of organization and management systems;

Introduction of means of computation into the national economy;

International cooperation in the field of information science;

Information science education;

National library of programs;

Management of computation centers.

This organization presents two original aspects:

The management of information processing resources throughout the national economy;

The operation of computation centers.

There presently exist 100 computation centers, 700 offices, and 400 stations. A computation center is characterized by the fact that it has one or more computers. Offices act as service bureaus, and stations are equipped only with means for data gathering and mechanical printing.

When the need arises (magnitude of work load), ICI decides on the transformation of an office into a computation center, and then assigns the necessary materiel and manpower to the new center. Each newly created center has a standard format (figure 1) which subsequently changes according to the needs of each center. Up to now ICI has caused the introduction of about 100 centers (150 computers, of which 130 to 140 FELIX).

This centralization of means is not limited to materiel, but also extends to programs. The National Library of Computer Programs (BNP) publishes every year a catalog of the programs available in Romania; the current issue contains about 300 programs, which have been developed either at ICI or at computation centers. For each program, the catalog lists its exact nature, its programming language, the computation center where it was perfected, and so on. Depending on its needs, each computation center can obtain any given program from BNP; the only charges are for duplication costs. In the case of particularly complex programs, technical assistance is provided either by ICI or by the center which created the program. These programs are not unchangeable: any computation center can modify them as long as it does not affect their results. These modifications must be submitted to ICI for approval; if they are retained, they are communicated to all the centers which use the given program.

Computation centers are apportioned by territories (equivalent to our concept of departments). Each center provides service to its customers (enterprises, collectivities, localities, and so on). All work is billed and an accounting program is used for the utilization of all the centers. Users assume the responsibility of data gathering and card punching, and submit their work according to predetermined planning.

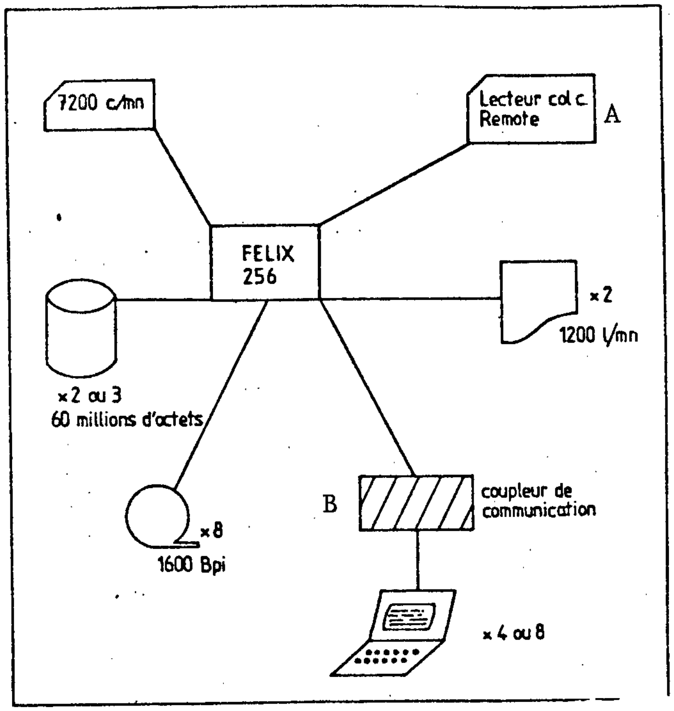

Figure 1. Standard configuration.

Key: A. Card reader and collector
B. Communication coupler

Within a given territory, the systems of different centers are compatible. Once a month, the directors of centers meet and discuss the modifications proposed by their engineers. The accepted proposals for modifications are then sent to ICI, which will examine them and either approve or reject them. In the case of a positive response, all the computation centers of a given territory will proceed with the modification. In case of failure of a center computer, this compatibility of all systems within a territory makes it possible to shift the work load of that center to all the other centers without creating difficulties for customers, and in fact without the knowledge of the latter.

A Special Computation Center: The Computation Center of the Financial-Banking System

This computation center performs a certain amount of work for the following organizations: the Ministry of Finance (80 territorial inspectorates); the National Bank of Romania (100 branches and offices); the Romanian Bank of Foreign Trade; the Bank for Investments (50 branches and offices); the Savings and Loan Bank (800 stations in enterprises and post offices); the Bank for Agriculture and the Food Industry (100 branches and offices); and the State Insurance Adminstration (200 branches and offices).

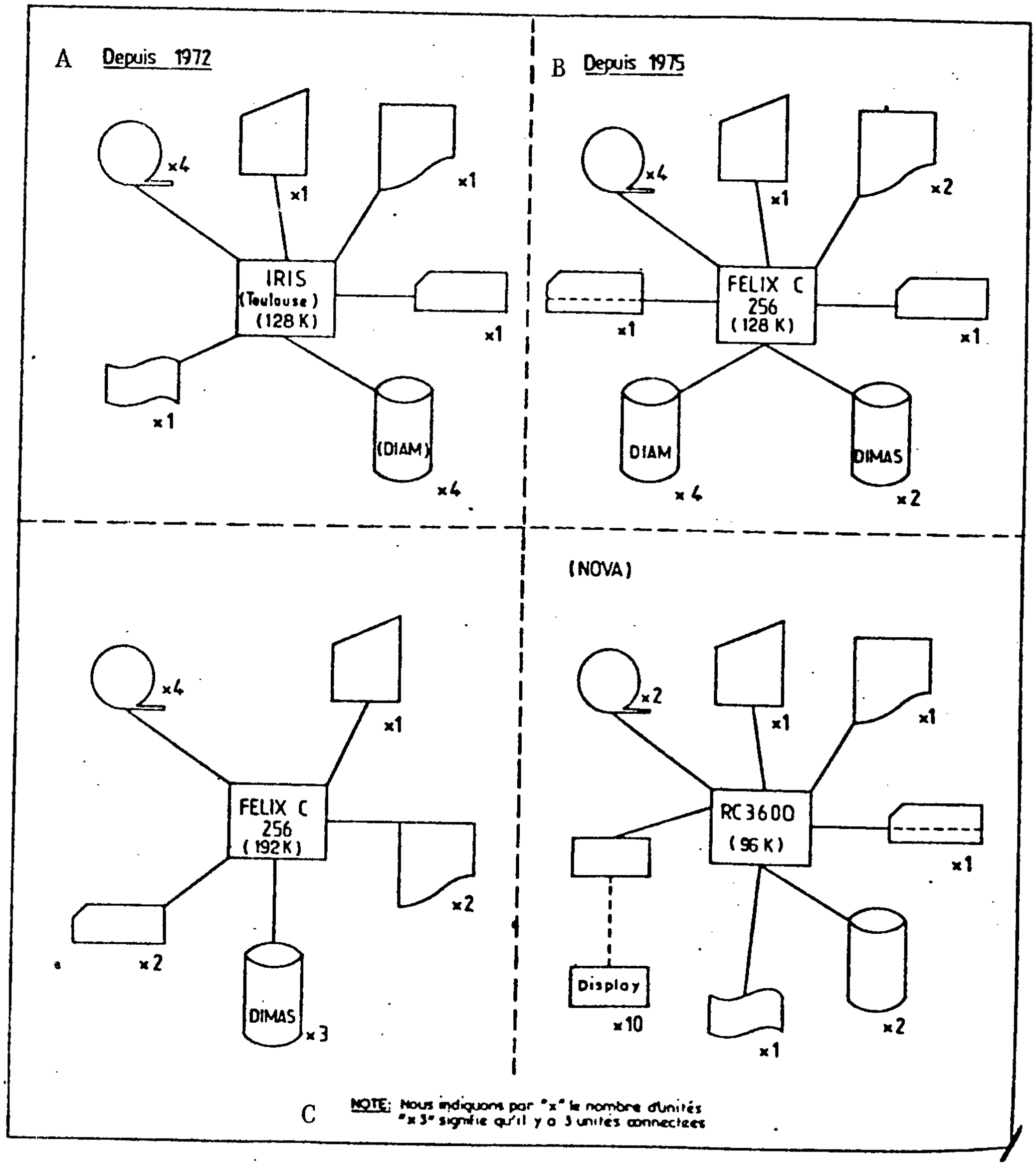

Figure 2. Configuration of the financial-banking system of Bucharest.

Key.
- A. Since 1972
- B. Since 1975
- C. "x" indicates the number of units; "x3" indicates that three units are connected

From 1968 to 1971, preliminary studies and personnel training were conducted with the support of ACTIM and CII.

The computation center and some of its applications were placed in operation from 1972 to 1975; these involved centralization and processing of balance-sheets, centralization and processing of sector ratios, centralization and processing of data concerning the budget, pilot applications for bank desks, payment plans for housing credits (private properties, growth rate of 15,000 per year), and organization of some insurance files (70 types of insurance).

More than 120 applications were developed between 1976 and 1978, representing 15,000 machine-hours at the Bucharest center and more then 5000 hours at other computation centers.

At present, the information processing performed by this computation center has the following characteristics:

Centralized direction of studies and projects;

Batch processing;

Decentralized data gathering on punched tape and magnetic tape at banks;

Uniform processing loads for banks, with periodic peaks for the Ministry of Finance;

Limits imposed by current equipment.

The present configuration is shown in figure 2. This center has 200 employees, of which 80 are analysts-programmers, and 120 are operators who perform data control and validation as well as carry out operations.

Between 1978 and 1980, the Computation Center of the Financial-Banking System has assumed a certain number of goals:

The utilization of specialized data bases with eventual conversion of the data developed so far;

Study and test of remote bank management;

Improvement of financial analyses and summaries;

Placement in operation of a real-time system for the Romanian Bank of Foreign Trade;

General use of daily management of bank accounts.

After 1980, the computation center expects to complete the national financial-banking network, provide real-time management of signal data, and proceed with the connection of the major systems of the economy.

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CURRENT TOXICOLOGICAL PROBLEMS IN THE CIVIL DEFENSE SYSTEM

Zagreb ARHIV ZA HIGIJENU RADA I TOKSIKOLOGIJU in Serbo-Croatian Vol 29, No 1, 1978 pp 43-49

[Article by A. Andelski, R. Kusic and N. Rosic, Federal Committee for Public Health and Social Welfare and the Military Technical Institute, Belgrade; based on paper read at a symposium of the Yugoslav Toxicological Association held in Bled, 10-12 May 1977]

[Text] This article discusses the main characteristics attending the development of modern chemical warfare weaponry and describes the most important categories of chemical warfare agents. In addition to military-tactical characteristics, the article also discusses the rules governing the rendering of first aid and the treatment of contaminated persons in the event of mass attacks employing these kinds of chemical warfare agents.

In the light of the all-people's civil defense concept a detailed description is given of the measures that need to be taken in all localities and regions of our country to provide for the organization of health and anti-chemical warfare protection.

Modern Chemical Weapons

Modern chemical weapons, the development of which has been proceeding at a steady pace in recent years, pose a real danger in the event of a possible future military conflict. This is attested to by the quantities of chemical warfare agents that have been produced and stockpiled and the broad selection of chemical warfare munitions as well as by the weapons systems that have been developed for their delivery (dispersion devices, cluster bombs, missile projectiles, and so on) (1, 2). Detailed tactical-technical principles have been worked out that govern the use of each individual chemical weapon, and their toxic effects have been tested. Work has also proceeded on the development of so-called "binary" chemical weapons, which are a kind of chemical armament that contains two mutually distinct, non-toxic reactants, which at the moment when this kind of weapon is launched react with each other and produce a chemical warfare agent that attacks the nervous system (2).

The development of this kind of chemical weaponry imposes major new tasks on the national defense forces and, in particular, on the national public health service both in terms of the need to provide for some means of defense against these weapons of mass destruction and human incapacitation and in terms of the need to eliminate the consequences of their toxic effects and to care for those who are injured by them.

Modern Chemical Warfare Agents Which Are Entering the Chemical Weapons Arsenal

Military neurotoxins of course occupy the most important position in the category of lethal chemical warfare agents. These neurotoxins are sarin, soman, tabun and VX. These highly toxic organophosphate cholinesterase inhibitors can be delivered by all kinds of chemical weapons, and they represent the primary lethal chemical warfare agents. While the first three toxins are primarily designed to contaminate humans via the respiratory system, VX is primarily intended to serve as a percutaneous contaminant. The tactical and technical characteristics of these toxins have been thoroughly established. The probable lethal concentrations of these toxins for man are well-known, and projections have been made of the casualties they are capable of inflicting in relation to varying degrees of technical and medical protective measures. Principles have also been worked out which are to govern the procedures followed in caring for contaminated persons, although in therapeutic terms there are still some unresolved problems, especially with respect to soman poisoning as well as with respect channels of contamination.

Other lethal toxins, though less common, may also find their way into chemical weapons arsenals. These include in the first place new forms of mustard gas (sulphuric and nitrogen yperite [mustard gas]) followed by general toxins in the hydrocyanic acid class and asphyxiators (phosgene and diphosgene). Of these toxins special emphasis needs to be placed on mustard gas because of its long-lasting action and very important tactical-technical characteristics.

The other category of modern chemical warfare agents consists of toxins that are used to make people temporarily incapable of carrying out their combat duties. These are nonlethal toxins which cause temporary incapacitation due to their toxic effects on individual physiological or psychological functions.

A special class of temporary incapacitation toxins consists of irritants, or fatigue-inducing toxins, which irritate the skin and accessible mucous membrane tissue. In addition to the more familiar tear gases and irritants of the chloracetophenone or brombenzylcyanide type, this class also includes the following modern chemical warfare agents:

1. CS (orthochlorbenzylidene malononitrile), several forms of which were used by the American army during the Vietnam War. This toxin is chiefly known for its lachrymal effects, the toxicological characteristics of which have been established (3, 4).

2. CR (dibenzo /b/ f-1, 4-oxazepine) has better physical properties than CS, is less toxic, and acts mainly as an irritant (3, 4).

3. BZ (3-quinuclidine benzylate) is a psychochemical toxin which induces a state of acute toxic delirious mental derangement in which the dominant symptoms are neurovegetative disturbances, perceptual disturbances (hallucinations, illusions, and so on), and, to a lesser degree, disturbances that affect the emotions, cognition, and thought processes (5). The mechanism of the action of the BZ toxin, which is relatively speaking not very toxic, is not well-known. It is predicted that contamination with this toxin is achieved through inhalation.

4. Staphilococcic enterotoxin (PG toxin) is a poison which by paralyzing certain physiological functions causes people to become temporarily incapacitated.

Botulinus toxin (type A) has also become a standardized chemical warfare agent. This is a highly toxic agent, the use of which poses special dangers due to the fact that specific serotherapy is possible only after clinical examinations have been completed, which of course is therapeutically not very effective.

First Aid for and the Treatment of Toxin Victims

Modern therapy for contamination with neurotropic chemical warfare agents can be classified as specific (antidotal) or non-specific (symptomatic) therapy.

Specific therapy is provided by administering reactivators of inhibited cholinesterase, i.e., oximes. At the present time it is expected that oximes in the monopyridinium oxime group, i.e., PAM2-Cl (pralidoxime), P2S (contrathion), and, in the bipyridinium oxime group, TMB4 (trimedoxime or dipyroxime) and toxogonine, will also be used for the treatment of contamination with neurotoxic chemical warfare agents.

As a symptomatic remedy used in the treatment of contamination with neurotoxic chemical warfare agents anticholinergetic drugs are also used that penetrate the central nervous system, and among these drugs atropine is most often preferred. Atropine, used in conjunction with oximes, constitutes the basic therapy for the treatment of contamination with neurotoxic chemical warfare agents, and this principle of combined therapy is a generally accepted practice in all countries. Even now there exist self-injection kits containing combinations of both these drugs. The medical doctrines of all armies prescribe the use of anticholinergetic drugs as first aid, and the only point on which these doctrines differ in this regard has to do with the combinations and types of oximes and other symptomatic drugs. In this way the problems associated with the problem of what kinds of remedies to use in rendering first aid and in the treatment of neurotoxic contamination has been completely resolved.

In addition to oximes and anticholinergetic drugs, anticonvulsion drugs (benzodiazepines, mild barbiturates) are used in the treatment of certain kinds of central nervous system disorders, e.g., convulsions. There is no need to administer neuroleptic drugs or strong barbiturates.

In the treatment of contamination victims great importance is attached to respiratory resuscitation, either in the form of oxygen therapy or in the form of the use of various mechanical respirators, especially in more severe cases. Various detoxification methods have also been used successfully (artificial blood dialysis, hemoperfusion).

As for the therapeutic methods used in the treatment of contamination with BZ-type psychochemical chemical warfare agents, symptomatic remedies are now being used, and some drugs in the pharmacological antagonist group are also being used (ezerine, thacrine).

There have been no changes in the methods used to give first aid and treatment to persons who have been contaminated with mustard gases and fatigue-inducing toxins. In serious cases either general symptomatic or specialized medical assistance is provided.

The Organization of Public Health and Anti-Chemical Warfare Protection

The concept of all-peoples civil defense requires that measures must be taken to protect the health of the civilian population and the armed forces in all localities and regions. However, wartime working conditions and the uniqueness of the nature and volume of wartime workloads makes it necessary for the public health service to adapt functionally and structurally to the needs and circumstances of wartime working conditions. For this reason, in accordance with the all-people's civil defense concept, health protection programs are organized at all levels of the sociopolitical communities--from the opstina and local community level up to the federation level, and the public health service modifies its peacetime configuration as much as necessary and as efficiently as possible. At the same time, a basic network of public health care organizations of associated labor is being developed at the opstina level, but the health protection system is based on establishment of public health care regions.

The public health care region is a district which encompasses the territory of two or more opstinas and in which all aspects of public health care services are provided independently without having to rely on health care organizations of associated labor outside of this territory, except in the event that a need arises for certain kinds of highly specialized assistance which can be provided on an inter-regional basis.

The boundaries of public health care regions are determined by the socialist republics and socialist autonomous provinces. In view of the fact that the overall organizational configuration of the public health service in time of war is based on its peacetime structure, wartime public health care regions are to be formed on the basis of the regional associations of opstinas which are set up in peacetime. In accordance with these principles, public health care regions should be endowed with capacities:

--by means of which it will be possible to provide, in addition to basic health care services, a full range of specialized preventive health care services, also including medical measures for the provision of RBH [expansion unknown] protection,

--for the provision of all types of out-patient-polyclinical and hospital treatment,

--for the collection and storage of blood,

--for the production of elementary medical aids and instruments,

--for the training of paramedical personnel,

--and for the distribution of medical supplies.

Each public health care region organizes it health protection services in a manner which best corresponds to local conditions, needs, and capabilities and also in a manner which is most responsive to the tasks that are set by higher-level sociopolitical communities in consideration of the special needs of the armed forces and the civilian population. The needs and other conditions of some regions will require their subdivision into smaller regions which will provide general kinds of health care services and the most needed kinds of specialized medical services. Depending on the level of development and capabilities of a given region, provisions will be made to establish capacities offering an appropriate cross-section of highly specialized medical assistance services, on which, in accordance with the plans drawn up by higher-level sociopolitical communities, neighboring regions will rely that are unable to develop these kinds of capacities (interregional cooperation).

Preventive medical health care will be provided by institutions which specialize in these kinds of services and by other public health care organizations of associated labor. General kinds of preventive medical care and RHB medical care will be provided by health care stations, health centers, and medical centers. Epidemiological medicine stations may also be formed within the framework of these public health care organizations of associated labor. Health centers and medical centers which have epidemiological medical staff are to offer specialized kinds of preventive medical care and RHB medical care, and large-scale health care institutions will offer these kinds of services on a specialized and highly specialized level.

Sick and wounded persons are to receive treatment from establishments that provide out-patient polyclinical, dispensary-type, and in-patient services, emergency medical services, mental and physical rehabilitation services, and house-call treatment services. General hospitals are the most common form of in-patient health care organizations of associated labor. In addition, there also exist certain kinds of specialized hospitals, and, by the same token, health stations and health centers can also have in-patient facilities for the hospitalization of sick and wounded that, by virtue of their professional staff complement and material capacities, are able to offer medical treatment services.

In time of war, especially when there is a large number of sick and wounded persons in need of treatment, public health care services are offered on four separate levels, i.e., self-administered health care, general medical care, specialized medical assistance, and highly specialized medical assistance. Each level has its own characteristic level of professional skill in terms of the medical treatment measures that are applied, and each level has its own health care service capacities in the form of permanent or temporary health care organizations of associated labor. Similarly, the classification of health care services into four separate categories results in the ranking of health service capacities into four separate, corresponding categories, whereby the tasks that are to be performed in response to wartime conditions and needs are in essence classified within the framework of the existing public health service structure. This means that under wartime conditions health care services are not always provided in a single location and in the same health care organizations of associated labor, rather the individual categories of health care services are separated from each other both in terms of space (geography) and, hence, in terms of time. Consequently, these services are to be provided sequentially, i.e., in phases, so that the level of health care is to be increased in direct proportion to the patient's remoteness in terms of time and space.

In keeping with this concept of an all-people's civil defense public health care system, protection is also to be provided against chemical warfare agents, i.e., medical-anti-chemical warfare protective measures are to be carried out, and persons contaminated with chemical warfare agents are to be cared for.

Within the context of these protective measures, in addition to various technical protective measures (the use of personal and group protective equipment), a number of other medical protective measures are to be taken such as: medical-chemical reconnaissance and observation, the detection and identification of chemical agents in water, food, living things and medical equipment, the expert examination and evaluation of contaminated water, food and medical equipment to determine if they can be used safely and the approval of their use, providing protection against contamination and the decontamination of infected persons, health care organizations of associated labor, and medical equipment.

The care of persons contaminated with chemical warfare agents encompasses measures and procedures involving the rendering of assistance, the classification of sick and wounded according to the severity of their cases, and the evacuation and treatment of casualties, in connection with which special problems are created by surprise, mass chemical attacks and by the need to give rapid aid to the largest possible number of casualties under conditions that are further complicated by environmental contamination. Under these circumstances the most important measures that need to be taken to care for chemical warfare casualties involve evacuation and decontamination and the application of etiological, pathogenic and symptomatic therapeutic measures.

When ranked according to the different categories of health care services medical anti-chemical warfare protective measures and the care of persons contaminated with chemical warfare agents comprise the following kinds of actions:

In the health self-protection category: chemical reconnaissance and observation under all kinds of working and combat conditions as a responsibility of each and every individual (soldiers, working people and citizens), the utilization of personal and group protective equipment, medical self-help and mutual aid measures, and self-decontamination and mutual decontamination measures;

In the general health care category: medical anti-chemical reconnaissance, the detection of chemical agents using detection devices, the detection of chemical warfare toxins in water, the collection of specimens for analysis, chemical decontamination, and the rendering of general medical assistance to contaminated persons;

In the specialized health care category: the detection and identification of chemical agents by means of laboratory analysis, expert chemical reconnaissance, the inspection of food, water and medical equipment and the making of assessments as to whether or not they are safe for consumption or use, and the expert rendering of medical assistance to contaminated persons;

In the highly specialized category (in addition to the above-mentioned tasks that fall within the specialized health care category): the resolution of complex problems that arise in connection with the expert evaluation of water, food and medical equipment and materiel, the evaluation of the local situation and local conditions with respect to levels of chemical contamination, the analysis of problems, and the development of procedural instructions and working methods.

The volume and difficulty of the tasks associated with caring for persons injured by chemical weapons under conditions where the appearance of a large number of such casualties is both unexpected and immediate will in most cases exceed the capabilities of the facilities and means at the disposal of public health services in the zone of attack and will therefore require a special organization and the taking of special measures in order to preserve the lives and health of injured persons in a prompt and efficient manner. For this reason, medical assistance will be provided in a phased manner, that is:

--in the first phase, i.e., at the very site where injuries were inflicted, first aid will be administered in the form of self-help and mutual aid by the soldiers themselves, by working people and civilians, civil defense units, Red Cross units and organizations of associated labor;

--in the second phase expert medical assistance will be provided in the form of general medical care in permanent or temporary health care organizations of associated labor (health care stations, general medical assistance stations, health centers);

--in the third phase specialized and highly specialized assistance will be provided, and casualties will be hospitalized in general or specialized hospitals.

Under these kinds of circumstances the large number of casualties and their sudden and irregular influx into in-patient health care organizations of associated labor will inevitably lead to the rapid filling of their capacities and to the paralysis of their other operations. Apart from effective work organization, the most appropriate solution to this problem would be to "profile" certain wards or entire hospitals that would be designated solely for the treatment of persons contaminated with chemical warfare agents, especially with a view to providing for the standardized medical care of those casualties requiring specific, complex and long-term treatment.

All health care organizations of associated labor which render medical assistance to persons injured by chemical warfare agents and hospitalize contaminated persons must have a trained staff and have access to substantial quantities of antidotes, drugs and resuscitation equipment. In order to be able to carry out the complex tasks associated with medical anti-chemical warfare agents the public health service must be prepared for this in advance--professionally, organizationally, personnel-wise and materially. Among other things, this preparatory work encompasses the following tasks:

--the training of all medical personnel in the toxicology of chemical warfare agents, in the application of protective measures, and also in the application of measures involving all forms of medical assistance to persons injured by chemical weapons,

--the training of the civilian population in how to defend itself against chemical warfare agents and in how to administer first aid to contaminated persons,

--the production of medical equipment and materiel to be used in rendering assistance to persons injured by chemical warfare agents and equipment to be used for personal and group anti-chemical protection and the distribution of this equipment and materiel to health care organizations of associated labor,

--making sure that preventive and laboratory services are equipped to detect and identify toxins in various environments (water, food, personal-use times),

--taking prompt action to provide for the protection of health care organizations of associated labor, their personnel, and their medical materiel and equipment by drafting medical anti-chemical warfare plans, building shelters and equipping basement areas for normal operations and for protective work, and purchasing protective equipment.

Medical toxicology centers are to play an especially important role in carrying out this preparatory work.

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